

TEMPERATURE VARIABILITY AND LONG-TERM SURVIVAL

Antonella Zanobetti, Department of Environmental Health, Harvard School of Public Health, Boston, USA

Marie S. O'Neill, Departments of Environmental Health Sciences and Epidemiology, University of Michigan School of Public Health, Ann Arbor, MI

Carina J. Gronlund, Departments of Environmental Health Sciences and Epidemiology, University of Michigan School of Public Health, Ann Arbor, MI

Joel Schwartz, Department of Environmental Health, Harvard School of Public Health, Boston, USA

Background and Aims: Time series studies show that cold and hot temperatures, and their extremes, are associated with increased death rates. Few if any studies have evaluated longer-term temperature associations with deaths. Because there is evidence of adaptation to usual temperature, but higher deaths at unusual temperatures, we hypothesized that a long-term exposure relevant to mortality might be temperature variability.

We investigated whether the variance of summer (June-August) and winter (December-February) temperatures were associated with survival in four cohorts of persons with predisposing diseases in 135 US cities. Rather than modeling exposure cross-sectionally, as typical in cohort studies, we treated temperature variance as a time varying exposure.

Methods: We used Medicare data (1985-2006), and constructed cohorts of persons hospitalized with: chronic obstructive pulmonary disease (COPD), diabetes, congestive heart failure (CHF), and myocardial infarction (MI). Yearly summer and winter temperature variance were linked to the individuals during follow up in each city. We applied Cox's proportional hazard model for each cohort within each city, adjusting for individual risk factors, and long term trends, and pooled results across cities.

Results: Significant summer hazard ratios for mortality, ranged from 1.038 (95% Confidence Interval (CI): 1.024, 1.052) per an IQR increase in summer variance for persons with CHF, to 1.055 (95% CI: 1.035, 1.076) for persons with an MI. Associations during winter were also significant, with a hazard ratio of 1.017 (95% CI: 1.009, 1.025) for CHF, and 1.018 (95% CI: 1.008, 1.028) for persons with MI, per IQR increase in winter variance. Associations were higher in the elderly and lower in cities with a higher percent of green space.

Conclusions: Increases in temperature variability in the cold and warm seasons were associated with increased mortality of the elderly. Some adaptation measures, such as green space, may ameliorate this effect.

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